

WHAT IS CLAIMED IS:

1. A rotary drill bit for penetrating earth strata, the drill bit comprising: an elongate bit body having an axial forward end; and a monolithic hard insert being affixed to the bit body at the axial forward end thereof, and the hard insert presenting at least three discrete leading cutting edges for cutting the earth strata wherein each said at least three cutting edges is stepped whereby the step improves the disintegration of the earth strata.

2. The rotary drill bit of claim 1 wherein the stepped cutting edge has an upper step and a lower step.

3. The rotary drill bit of claim 2 wherein
15 the leading cutting edge of the upper step and the
leading cutting edge of the lower step are parallel.

4. The rotary drill bit of claim 1 wherein both said leading cutting edges of the lower step and upper step are oriented at an angle of about 20 degrees with respect to the horizontal.

5. The rotary drill bit of claim 2 wherein a transition portion is positioned between the lower step cutting edge and the upper step cutting edge the transition portion rises a vertical height of generally between 1/16-1/8.

6. The rotary drill bit of claim 1 wherein the rotary drill bit having a central longitudinal axis passing through the hard insert, the bit body having a peripheral surface, and each one of the leading cutting edges for cutting the earth strata begins at a point 30 radially outward of the central axis of the hard insert and extends in a direction away from the central axis.

7. The rotary drill bit of claim 1 wherein each one of the leading cutting edges for cutting the

earth strata being formed by a corresponding leading surface of the hard insert intersecting a corresponding top surface of the hard insert.

8. The rotary drill bit of claim 6 wherein
5 each of the stepped cutting edges has an radially inward upper step and a lower step.

9. The rotary drill bit of claim 8 wherein said cutting edge of each said upper step and lower step has a length of generally between 1/8-1/4 inches.

10 10. The rotary drill bit of claim 1 wherein each one of said leading cutting edges has a leading surface being disposed at a rake angle of between about zero degrees and about negative fifteen degrees.

11. The rotary drill bit of claim 2 wherein
15 each one of said cutting edges has a lower leading surface adjacent the lower step cutting edge being disposed at a rake angle of between about zero degrees and about negative fifteen degrees .

12. The rotary drill bit of claim 11 wherein
20 each one of said upper steps has an upper leading surface adjacent the upper step cutting edge the upper step cutting edge being disposed at a rake angle of between about zero degrees and about fifteen degrees.

13. The rotary drill bit of claim 2 wherein
25 the upper step cutting edge has a relief angle of about 30 degrees and the lower step has a relief angle of about 21 degrees.

14. The rotary drill bit of claim 2 wherein
30 the lower step has a generally planar lower rake surface and the upper step has a second generally planar upper rake surface.

15. The rotary drill bit of claim 14 wherein the lower rake surface forms an angle with the vertical

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different from an angle which said upper rake surface makes with the vertical.

16. The rotary drill bit of claim 15 wherein the lower rake surface angle is between zero and negative ten degrees and the upper rake surface angle is zero and fifteen degrees.

17. The rotary drill bit of claim 16 wherein said lower rake angle is zero degrees and the upper rake angle is negative five degrees.

18. The rotary drill bit of claim 1 wherein the drill bit body having at least one scalloped portion containing a debris port therein, and a debris breaker being in the scalloped portion mediate of the debris port and the axial forward end of the drill bit body.

19. A rotary drill bit for penetrating earth strata, the drill bit comprising: an elongate bit body having an axial forward end; and a hard insert being affixed to the bit body at the axial forward end thereof, and the hard insert having at least three discrete leading cutting edges for cutting the earth strata wherein each said at least three leading cutting edges are nonlinear.

20. The rotary drill bit of claim 19 wherein the hard insert has a generally planar lower rake surface and the upper step has a second generally planar upper rake surface.

21. The rotary drill bit of claim 20 wherein the lower rake surface forms an angle with the vertical different from an angle which said upper rake surface is offset from the vertical.

22. The rotary drill bit of claim 19 wherein the hard insert being a single monolithic member.

